

NATIONAL REGISTER. BULLETIN



Technical information on comprehensive planning, survey of cultural resources, and registration in the National Register of Historic Places.

U.S. Department of the Interior
National Park Service
Interagency Resources Division

PUBLIC DOCUMENTS
DEPOSITORY ITEM

NOV 07 1990

CLEMSON
LIBRARY

Guidelines for Evaluating and Documenting Historic Aids to Navigation




Mission: As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally-owned public lands and natural and cultural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. Administration.



Sand Island Light has marked the entrance to Mobile Bay and the Mobile Ship Channel since 1873. The oldest light in Alabama, it is the third light to stand on this small island. Granite molding defines the polygon-shaped base. On the interior, an iron circular staircase leads to the watch room. Above the watch room, the glass lens room is topped with a conical copper roof. (Lacey Photography)

TABLE OF CONTENTS

INTRODUCTION	1
BACKGROUND	1
TYPES OF HISTORIC AIDS TO NAVIGATION	2
RESEARCH, FIELD WORK, AND DOCUMENTATION	2
Research	2
Field Work	4
Documentation	4
QUALIFICATIONS FOR EVALUATORS	4
EVALUATING HISTORIC AIDS TO NAVIGATION	5
CRITERIA FOR EVALUATION	5
Criterion A	5
Criterion B	6
Criterion C	6
Criterion D	7
Archeological Documentation	7
Maritime Archeology	8
CRITERIA CONSIDERATIONS	8
Resources Less than 50 Years Old	8
Reconstructions	8
INTEGRITY	8
Location	8
Design	8
Setting	8
Materials	8
Workmanship	8
Feeling	9
Association	9
PREPARING THE NATIONAL REGISTER NOMINATION	9
Section 7: Description	9
Exterior Description	10
Interior Description	10
Optics and Illuminants	11
Sound Signals	11
Daymarks	12
Site Layout and Other Features	12
Integrity	13
Section 8: Statement of Significance	13
Section 9: Major Bibliographical References	14
Section 10: Geographical Data	14
Accompanying Documentation	14
NATIONAL HISTORIC LANDMARKS	14
RECOMMENDED BIBLIOGRAPHY AND SOURCES	15
National Park Service Publications	15
<i>National Register Bulletins</i>	15
Maritime Preservation Program	15
National Historic Landmark Program	15
Published Sources	15
Journals	17
HISTORICAL AND PRESERVATION ORGANIZATIONS	
CONCERNED WITH HISTORIC AIDS TO NAVIGATION	17



Digitized by the Internet Archive
in 2012 with funding from
LYRASIS Members and Sloan Foundation

<http://archive.org/details/guidelinesforeva00delg>

Guidelines for Evaluating and Documenting Historic Aids to Navigation

James P. Delgado and Kevin J. Foster

INTRODUCTION

The National Register of Historic Places is an important tool for maritime preservation. Utilizing uniform National Register criteria to evaluate significance and integrity is an important first step in planning for the preservation of historic aids to navigation. Listing an aid to navigation in the National Register provides an incentive for preservation by recognizing it as being significant and worthy of preservation. Listing also provides a measure of protection from the actions of the Federal government and can be a source of funding when monies are available.

This bulletin is intended to help Federal Historic Preservation Officers, State Historic Preservation Officers, Certified Local Governments, maritime preservation professionals, and concerned citizens nominate lighthouses and other historic aids to navigation to the National Register. General instructions for completing National Register nominations are in *National Register Bulletin 16: Guidelines for Completing National Register of Historic Places Forms*. Bulletin 16 and this one should be used in tandem when preparing a nomination for a historic aid to navigation.

BACKGROUND

The lighthouse is the most romantic symbol of the maritime past. Marking dangerous headlands, shoals, bars, and reefs, lighthouses have guided vessels safely on their voyages since antiquity. Often placed in rugged, remote locales, in shifting sand, on coral reefs, and on surf-washed rocks, lighthouses posed many engineering challenges in their construction. The technology of the light itself also presented a challenge; the importance of a constantly lit signal, visible for miles out to sea, attracted the attention of many inventors.

Lighthouses, daymarks, sound signals, and buoys all serve as aids to navigation. The earliest aid to navigation was probably a prominent natural landmark: a stand of trees or two



The Goose Rocks Light Station marks the east entrance to the Fox Island thoroughfare between Vinalhaven and North Haven Islands in Maine. The caisson or sparkplug light, constructed in 1890, stands on a shallow rock ledge. Within its walls are the keeper's quarters and the storage facility. The light guides not only cargo ships but pleasure vessels as well. The two islands attracted many summer tourists with numerous hotels and cottages built to serve the growing resort communities.
(Roger G. Reed)

mountain peaks that aligned. But landmarks could be confused with one another, so distinctive manmade markers called beacons were erected along the coastline to help warn off or guide mariners. Beacons were useful only during daylight hours. Light signals guided ships at night. Begun as bonfires on shore, they increased in complexity and effectiveness to become towers built high above the surf. The need for aids to navigation boomed as maritime trade and commerce flourished. In the 17th, 18th, and early 19th centuries the number of lighthouses rapidly increased.

During the 17th and 18th centuries, numerous aids to navigation in North America included daybeacons, lanterns placed atop poles, and signal guns fired to guide ships into harbor. The first built lighthouse in the present United States was erected in 1715-1716 with the construction of the Boston Light on tiny Beacon (now Little Brewster) Island. First lit on September 14, 1716, the Boston Light's "feeble flame," noted historian F. Ross Holland, "gradually grew brighter, and in time illuminated all the shores of the United States." Nine other Colonial lights were built between the 1740s and the 1760s. With the establishment of the United States of America, as its ninth act after adopting the Constitution and the Bill of Rights, Congress assumed federal responsibility for the construction and operation of aids to navigation. This act, passed on August 7, 1789, inaugurated more than 200 years of federal commitment to safe navigation.

Since the Lighthouse Act of 1789, more than 1,000 lighthouses have been built along with hundreds of fog signals and nearly 200 lightships. Congress created a special Lighthouse Board in 1852 to manage this important service. The Board became the Bureau of Lighthouses in 1910. In 1939, the Bureau and its employees in the United States Lighthouse Service were amalgamated with other agencies with maritime responsibilities to become the United States Coast Guard. The Coast Guard has retained authority over the nation's aids to navigation since then. Tied uniquely to the maritime history of the United States, lighthouses not only served a functional role but also became part and parcel of American culture. George R. Putnam, the first head of the Bureau of Lighthouses, noted that "the lighthouse and lightship appeal to the interest and better instinct of man because they are sym-

bolic of never-ceasing watchfulness, of steadfast endurance in every exposure, of widespread helpfulness. The building and the keeping of the lights is a picturesque and humanitarian work of the nation."

Lighthouses and sound signals are now passing from the American scene. Technological changes in the 20th century ultimately doomed manned lighthouses; the last keeper left his station in 1989, the Bicentennial year of America's lighthouses. Some lighthouses now stand dark, while others now automated still function. Many lights are in nonfederal hands. The Coast Guard has control over some 500 active lights. Other federal agencies are responsible for approximately 150 inactive light stations.

The ravages of time and weather strongly affect aids to navigation which were intentionally built in exposed locations. The harsh marine environment washes away foundations, dissolves mortar, crumbles stone and brick, and corrodes metal. Lighthouses are a finite resource in danger of being lost. The issue of lighthouse preservation is critical. This National Register Bulletin was prepared to assist in determining where and what aids to navigation survive and assessing their significance and integrity.

TYPES OF HISTORIC AIDS TO NAVIGATION

There are seven basic types of historic aids to navigation that might be considered for nomination to the National Register.

Manned Lighthouses. These structures are lighthouses built with accommodations for keepers and intended to be regularly occupied and operated. Manned lighthouses may be a part of a district including the lighthouse, keeper's quarters, oil houses, cisterns, docks, etc.

Unmanned Lighthouses. These are lights that did not require constant tending. They are generally small individual light towers built to mark a channel or pierhead.

Sound Signals. These are fog signals of all types. Fog signals were generally placed in conjunction with a light and usually form one component of a light station. Sound signals usually are in a separate structure on a station. A few stations were built solely as sound signals, some of which later received lights.

Range Lights. These are pairs of lights, located some distance apart,

which are visually aligned by the mariner to delineate a channel or harbor entrance.

Daymarks. These are conspicuous marks, formerly known as beacons, that are used as a visual guide to mariners during daylight hours. While painted rocks and prominent landmarks have served as daymarks, the most common form is the numbered board of distinctive shape and color used to delineate channel boundaries. The shape and markings of the towers of lighthouses served as daymarks. The Cape Hatteras Light tower, for example, was painted with a black and white spiral pattern.

Lightships. These are floating light stations moored offshore or in locales where a lighthouse cannot be built or reach with its light. Lightships are historic vessels and should be evaluated in accordance with National Register Bulletin 20, *Nominating Historic Vessels and Shipwrecks to the National Register of Historic Places*. This bulletin (Number 34) should also be consulted when assessing these vessels as aids to navigation.

Buoys. These are moored floating objects of various shapes that serve as daymarks. Some buoys are lighted or support sound signals. Individual buoys are easily portable objects and as such are not generally eligible for National Register listing.

Pieces of equipment from an aid to navigation, detached and displayed apart from their natural setting at a light station, are not considered eligible for listing in the National Register.

RESEARCH, FIELD WORK, AND DOCUMENTATION

Research

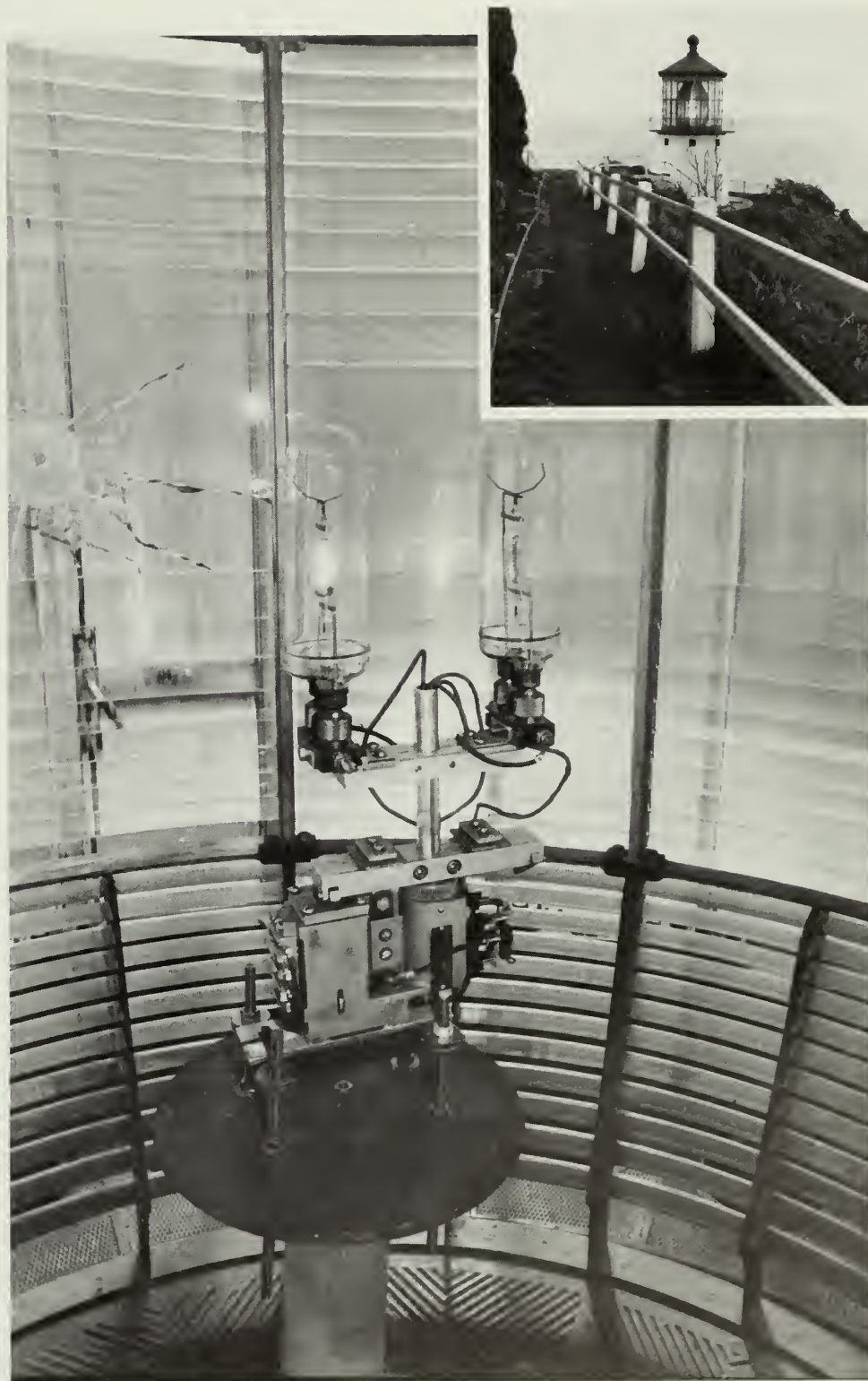
Aids to navigation have been described in a variety of ways. Reports describing aids to navigation emphasize features of interest to different audiences. For example, navigators only needed to know the description and position of a lighthouse. Accountants needed physical descriptions of all property at a light station. Engineers needed technical data. In evaluating the significance of aids to navigation, all of these various sources may be useful.

The National Park Service, in cooperation with the U.S. Coast Guard, lighthouse historians, preservationists, groups, and owners, is compiling a computerized inventory of all known,

extant historic lighthouses and aids to navigation in the United States and its territories: *Preliminary Inventory of Historic Aids to Navigation in the United States*. The various characteristics, including location, type, foundation, materials, date of establishment, date of construction for the extant aid, type and number of structures at a station, height, focal plane, and type of optic and sound signal, for example, are listed in the inventory. The inventory is constantly revised and annually released as a photocopied publication.

Detailed files on most lighthouses are available at the historian's office of the U.S. Coast Guard at its Washington, D.C., headquarters. A national overview describing 418 of an estimated 1,200 lights is available in *America's Lighthouses: An Illustrated History* by Francis Ross Holland. Several regional lighthouse histories and guides have been published. Lighthouses and other aids to navigation may also have been surveyed by the State Historic Preservation Office or locally. The State Historic Preservation Officer should be consulted to determine if the State has information which will assist in the evaluation of the aid to navigation. Information may also be available from local and regional maritime and lighthouse museums, the Office of the U.S. Coast Guard Historian and the aids to navigation branch of the U.S. Coast Guard at their Washington, D.C., headquarters, Coast Guard district offices, the Maritime Department of the National Trust for Historic Preservation, and national organizations such as the United States Lighthouse Society, the Lighthouse Preservation Society, and the Great Lakes Light Keepers Association, as well as other maritime historical and/or preservation organizations and professionals. One or more of these organizations or individuals may have already researched the career of a lighthouse or evaluated its significance. A listing, including address and telephone number, of these and other such groups and individuals is available from the Maritime Preservation Department of the National Trust for Historic Preservation in Washington, D.C.

The characteristics of a light or sound signal were published by the Federal government from 1838 to 1851 as a *List of Lighthouses, Beacons, and Floating Lights of the United States*. In 1852 the Lighthouse Board began publication of a *Light List*, which through the years has grown and improved. The current edition of the *Light List* is a five-volume



Makapuu Point Light in Waimanolo, Hawaii, was built in 1909 as a result of the grounding of the large Trans-Pacific ocean liner, MANCHURIA. The light oversees all commerce bound for Honolulu from the West coast of North America. The lighthouse has a cylindrical concrete tower with a conical copper roof and rectangular-shaped storm panes. Lighting equipment consists of a large hyper-radiant fixed lens; it is the only one of its type in Hawaii. Makapuu means "bulging eye" in Hawaiian, which describes its oversized lens perfectly. (James P. Delgado, National Park Service)

work systematically and geographically arranged. Lights are listed by State and Coast Guard district and then sequentially along the coast or waterway. The publication lists:

- the navigation chart number on which the light appears
- the name of the light
- its characteristics
- its location (both latitude and longitude and a written description)
- a description of the structure
- its height above the ground and the height of its focal plane
- the range of the signal
- remarks on features such as color and reflectors, and
- whether the aid is privately or publicly maintained.

The *Light List* is the primary historical reference to be consulted for obtaining the legal measurements of a light. The edition published in the year that the aid was first built and those published in subsequent years should be consulted along with the present edition to determine changes to the aid through its career. A complete set of the *Light List* is available at the Library of Congress. Various editions are available in regional libraries and repositories. The current edition is available for sale through the Government Printing Office.

The particulars of an aid to navigation's career will largely be found in the annual reports of the Lighthouse Board, Bureau, and Service, published from 1852 to 1939, and thenceforth in the annual reports of the Coast Guard. Detailed correspondence (including materials purchases; change orders; and references to political pressures involved in establishing, constructing, and operating lighthouses, including the highly detailed description forms forwarded to the Commissioner of Lighthouses) is compiled in Record Group 26, the records of the Coast Guard, at the National Archives in Washington, D.C. Record Group 26 also includes plans of some lights. Many original drawings and plans of operating aids are filed with Coast Guard district offices. For several years, descriptions of light and sound signal stations were required from keepers and filled out on printed forms. These forms are a good source of real property descriptions of light stations and should be consulted. Copies may be found in the National Archives, at some Coast Guard Regional and local offices, and occasionally in historical societies and museums. The United States Lighthouse Society library (see



The light tower of St. Martin Island in Michigan is an excellent example of a pure exoskeletal tower on the Great Lakes. The six-sided tower is supported by six exterior steel posts which have latticed buttresses. The Fourth Order Fresnel lens consists of two glass panels separated by a brass reflector so that when turned, the lens produces alternating red and white flashes. (U.S. Coast Guard)

bibliography) holds a number of these forms as well.

Examining any extant drawings or plans of the aid to navigation, e.g., construction plans, drawings, and renderings of lenses and other equipment may be useful. Technical manuals on the operation of specific equipment, such as sound signals, lamps, or lenses, may also be consulted if the property retains such equipment. Historic photographs, lithographs, and sketches of an aid, including construction photographs, overall views, and interiors, may help to assess construction methods, workmanship, and specific features. Local newspapers may reference the construction of an aid to navigation. Research at local and State historical societies, museums, and libraries may also prove helpful. Diaries, letters, and reminiscences of keepers and their families are yet another invaluable resource but require time and effort to locate.

Field Work

Adequate field examination of an aid to navigation may involve more than one visit to acquire a thorough understanding of the aid's construction, equipment, and layout. When evaluat-

ing a property for the first time, a guided tour of the aid, emphasizing condition, restoration or maintenance work, and the aid's history should be conducted by knowledgeable individuals. Often, the most knowledgeable persons will be aids to navigation officers of the Coast Guard, as well as the crews who maintain active aids to navigation. Discussions of foundations, such as caissons or screw piles, should be reviewed with engineers. The field examination of an aid to navigation should be a thorough process which leaves an evaluator with complete understanding of how an aid to navigation was built, operated, modified, and maintained through time.

Documentation

As the research and field work progress, files of notes, sketches, reproduced reference materials, and photographs should be compiled. If an aid to navigation has changed over time, chronologically arranged files of plans, photographs, and notes will help to understand the progression and nature of the alterations. Color slides of the aid to navigation may be useful in preparing the National Register nomination when returning to the site is not possible.

Black and white photographs of the aid to navigation should be taken. The quality of the photographs actually included in the nomination will benefit from selecting among a wide choice of photographs. Historic photographs and graphics may be located and copied for inclusion with the nomination. Historic plans may be copied in photographs to aid in documentation. If historic plans do not exist, modern plans may be prepared, although these are not required for National Register nominations.

QUALIFICATIONS FOR EVALUATORS

Individuals recommended to prepare nominations for historic aids to navigation should be knowledgeable in maritime studies usually with academic backgrounds in such fields as American history, maritime history, archeology, historic preservation, or American studies. Individuals conducting work described in this bulletin should be familiar with lighthouse types, construction, engineering, lens types and manufacture, and particularly the terminology used to describe these features. They should also be familiar

with the development and chronology of aids to navigation types in North America.

EVALUATING HISTORIC AIDS TO NAVIGATION

To qualify for the National Register, a historic aid to navigation should be an example of one of the first six types listed above; retain integrity of location, design, setting, materials, workmanship, feeling, and association; and meet one or more of National Register criteria (A, B, C, and D) listed under the Criteria for Evaluation Section of this bulletin. The significance of a historic aid to navigation can only be determined through a systematic investigation of its qualities, associations, and characteristics. A typical investigation for a historic aid to navigation nomination should include the following:

- identification of the specific type of aid to navigation and the documentation of its individual characteristics based on a physical inspection of the aid and documentation of its history;

- identification of the historic context(s) associated with the aid to navigation based on documentation of its history; and
- evaluation of the significance of the aid to navigation based on the National Register criteria.

CRITERIA FOR EVALUATION

To be eligible for the National Register, an aid to navigation must be significant in American history, architecture, archeology, engineering, or culture, and possess integrity of location, design, setting, materials, workmanship, feeling, and association. The aid to navigation must meet one or more of the four National Register criteria. It must:

- A. be associated with events that have made a significant contribution to the broad patterns of our history; or
- B. be associated with the lives of persons significant in our past; or

C. embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction; or

D. have yielded, or may be likely to yield, information important in prehistory or history.

For specific applications of the criteria, refer to National Register Bulletin 15, *Guidelines for Applying the National Register Criteria*.

CRITERION A

Under Criterion A, association with events that have made a significant contribution to the broad patterns of history, an aid to navigation may qualify for listing in the National Register through its association with historic themes. Applicable areas of significance (as listed in Bulletin 16) would include the obvious maritime history theme as well as several other categories. Therefore, historical background



The Isles of Shoals have served as a landmark for mariners since their discovery. The Shoals are a group of nine rocky islands lying southeast of the mouth of the Piscataqua River. Strategically located in the southern part of the Gulf of Maine, the Shoals are within the track of extensive transportation and commerce. In 1859, this brick tower was built on White Island to guide and protect passing ships. (Douglas Armsden)

information must be provided to explain the significance of the aid. Areas of significance to consider are:

Art: Lighthouses or stations that influenced famous American seashore or maritime paintings such as those of Winslow Homer.

Commerce: Aids to navigation constructed to expand commerce and trade.

Communication: Aids to navigation employed in semaphore telegraph systems and in pioneer ship-to-shore wireless transmissions.

Engineering: Lighthouses important for technological developments of structural types (such as screw pile or caisson lights) or lenses (optics) or light sources (illuminants).

Entertainment/Recreation: Lighthouses, particularly those in the inland States, were often tourist destinations and played an important role in the development of recreation and tourism industries.

Government: Aids to navigation that represented growing State and Federal government involvement and responsibility for safe navigation; aids whose establishment represented the primary Federal incursion into responsibility for aids to navigation in a given State or region.

Invention: Aids to navigation where experimentation resulted in new developments in optics, lighting devices, sound signals, communications, and other technologies.

Literature: Lighthouses associated with noted authors or poets or that influenced famous literature.

Military: Aids to navigation modified for military use—some coastal lights served as harbor defense range stations and searchlight installations during the Second World War; lights established in military installations and harbors; lights that were damaged or partially destroyed for military reasons during wars.

Social/Humanitarian: Light stations whose personnel figured in notable rescues of shipwreck victims.

Transportation: Aids to navigation used to guide vessels transporting freight and passengers.

CRITERION B

Under Criterion B, association with persons significant in our past, an aid to navigation will possess significance if a person's historical prominence is tied directly to the aid. These persons should have a strong tie to the property, such as keepers or politicians who



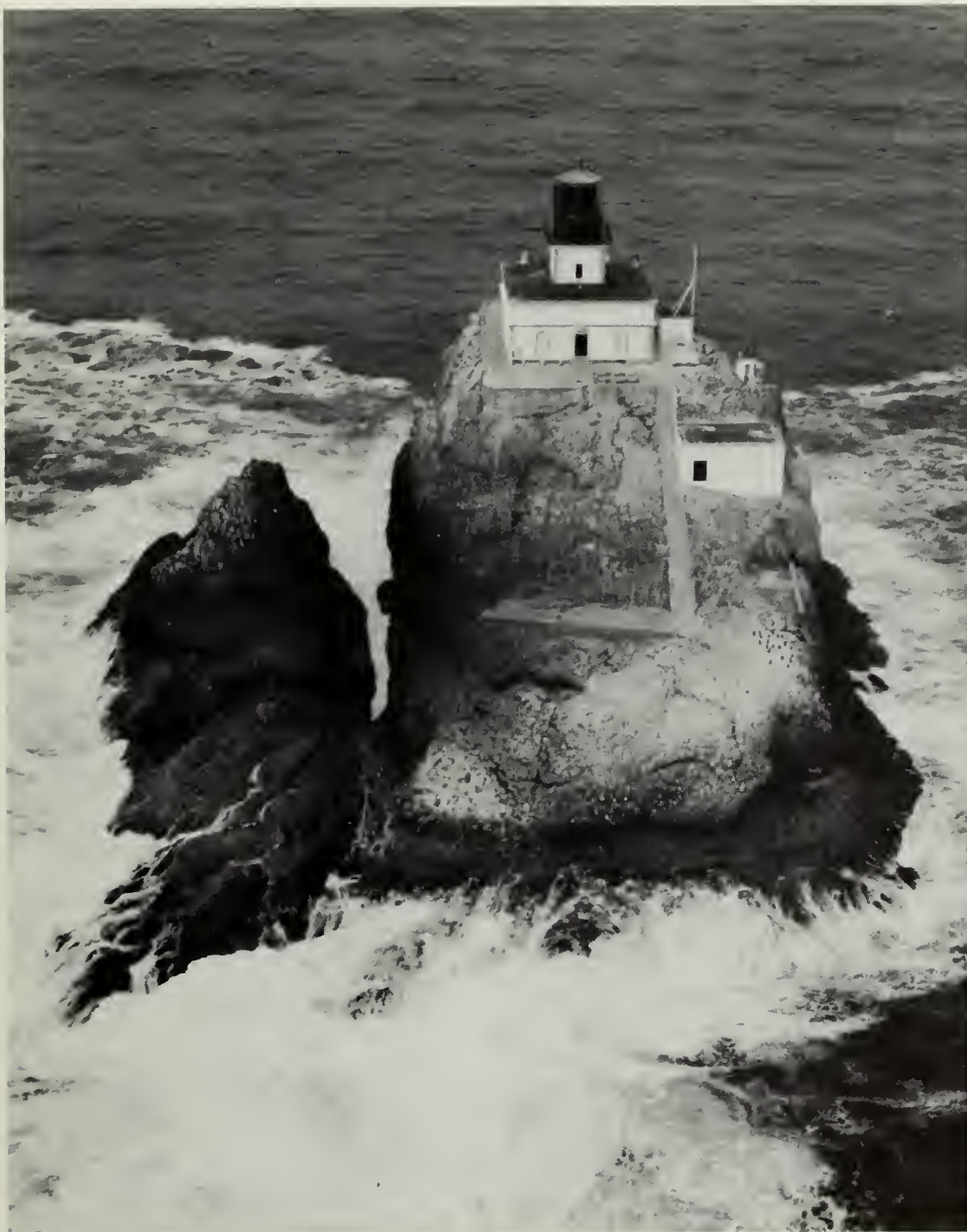
Constructed between 1857 and 1859, Cape Lookout Lighthouse became the prototype of all lighthouses to be erected on the Outer Banks of North Carolina. At night, its beam warns sailors of the dangerous shoals on Core Banks; by day, its diagonal checker pattern is a distinctive daymark. The Station includes the lighthouse, the keeper's dwelling, a generator house, a coal and wood shed, and an oil house. Towering 169 feet above the sand, Cape Lookout Lighthouse is a conical brick shaft. The light is a non-rotating first order classical one optic lens. (National Park Service)

fought for the establishment of the aid. This significance would not, for example, relate to visits to the aid by important people. National Register Bulletin 32, *Guidelines for Evaluating and Documenting Properties Associated with Significant Persons*, provides further guidance on Criterion B and its applications.

CRITERION C

Under Criterion C, an aid to navigation possesses significance if it em-

bodies the distinctive characteristics of a type, period, or method of construction, or represents the work of a master, possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual distinction. An aid to navigation must possess certain features to be a good representative of its type, period, or method of construction. These features vary. For example, in analyzing an early 20th century caisson lighthouse, a researcher would



Tillamook Rock Lighthouse is significant as Oregon's only offshore light and the fourth oldest of nine lighthouses now standing on the State's coast line. Its construction, completed in 1881, was an engineering feat involving hazardous landings of workers and materials by derrick and breeches buoy from a lighthouse tender anchored off the rock. Its isolated and exposed position atop a solid basalt islet more than a mile offshore made it not only an extremely lonely post for its tenders but also one of the most challenging. The powerful beam has guided thousands of ships safely past one of the most hazardous sections of coast line on the continental United States and into the Columbia River shipping lanes, integral to the economic history of Oregon and the Northwest. (Seaside Photo)

look for the characteristic *sparkplug* shape with a circular steel platform rising up from a submerged foundation, with a steel light tower, keeper's quarters, and boat falls mounted atop. A caisson light rebuilt when automated, with the top stories replaced by a small modern beacon, might still be identifiable as a caisson lighthouse because the caisson itself remains, but it is no longer a good representative of the type.

Aids to navigation are usually found

to be eligible for National Register listing under Criterion C within the following categories:

Architecture: An aid to navigation may be significant if it is: 1) a good representative of a specific style of architecture, such as a Cape Cod style light; 2) a good representative of a specific type, such as a screw pile, caisson, or octagonal stone tower; or 3) a good example of the work of a master.

Art: An aid to navigation may be significant for artistic works incorpo-

rated into the structure, such as stations with decorative sculpture reliefs or murals.

Engineering: An aid to navigation may be significant because of the engineering required for its construction, such as Minot's Ledge light or the screw pile lights in the Florida Keys. Some aids may be significant for their optics and sound signals, such as stations which retain their clockwork mechanisms for revolving lenses or bell-strikers. Engineering achievements that are no longer extant do not impart significance in this area.

CRITERION D

Under Criterion D, an aid to navigation is significant if archeological research at the site has yielded or is likely to yield information important to history. These data might include: design information, methods of construction, operation, and life at no longer extant lights and other aids to navigation. Examples of sites that might possess significance under Criterion D include archeological remains of earlier stations on the site or missing components of an extant aid. For example, if only the tower of a light station survives, archeological study of the remains of the outbuildings, quarters, trash pits, and structures may provide a detailed picture of the station and life there and enhance a sketchy or largely undocumented historic record.

Archeological Documentation

Archeological significance is determined by the assessment that the archeological resource, and the scientific analysis of it, will add to or revise the understanding of history. This is done by documenting the poorly recorded or undocumented aspects of an aid to navigation, such as the layout and construction of the earliest Colonial lights. The nomination should clearly demonstrate that the archeological information obtained from the site will significantly supplement or revise current historical or archeological knowledge or understanding.

When documenting the archeological features of an aid to navigation, the nomination should stress how the site is known to possess archeological remains, such as through remote sensing or archeological test excavation. The documentation of no longer extant aids to navigation, including missing or earlier buildings and structures at existing aids, should include descriptions and characteristics determined through

archival research that are then assessed, verified, or contrasted with the actual physical, archeological record. Archeological documentation should include a site plan showing where excavation units were placed, recording drawings of exposed features (such as a lighthouse foundation or a deposit of material culture in a trash pit). Include photographs of archeological features or significant artifacts.

Maritime Archeology

Aids to navigation, like ships, often housed isolated, self-sufficient societies. When assessing the archeological nature of an aid to navigation site, the nomination should include research questions answered through remains at the site. Anthropological concerns include the lifeways of isolated communities; the characteristics of a society under stress (because of isolation, serious responsibility, adverse environmental conditions, and hazardous duty); the specific nature of self-sufficiency, particularly of small island stations; and social stratification among keepers, assistant keepers, and their families. If the archeological excavation of the site of a light station or other aid provides insight into concerns such as those stated above, the specific archeological evidence conveying significance should be described and documented in the nomination.

CRITERIA CONSIDERATIONS

Certain types of historic aids to navigation as a general rule do not qualify for the National Register. These would be: aids less than 50 years of age; reconstructed aids to navigation; aids to navigation moved from their original sites; and collections of artifacts from aids to navigation, including large artifacts such as lenses, fog signal equipment, and other parts of light stations removed from their setting. However, some of these properties may qualify for National Register listing if they meet the following exceptions.

Resources Less than 50 Years Old: An aid to navigation achieving significance within the past fifty years can be listed in the National Register if it is of exceptional significance. To qualify, an aid to navigation must be associated with important but recent themes or developments (such as World War II) which scholarly or professional research has recognized as significant in the history of aids to navigation engineering, construction, or operation.

Aids to navigation potentially eligible under these circumstances would include, for example, the first *Texas Towers* installed to replace lightships. An aid to navigation must be compared with other aids of its type that have similar associations and qualities to establish exceptional significance.

Reconstructions: In rare instances, reconstructions at a historic light station can be contributing elements of a National Register property if: 1) the reconstruction is based on scholarly analysis of graphic, written, and archeological sources; 2) the reconstruction is accurately executed, using appropriate period materials and construction techniques; or 3) the reconstruction is presented in a historically appropriate manner as an integral part of restoring a group of properties, such as a light station, which together constitute a historic district. Reconstructed aids to navigation must be part of an overall restoration plan for the entire resource.

Reconstructed aids to navigation are not generally eligible for the National Register because they are not authentic historic resources.

INTEGRITY

The National Register traditionally recognizes a property's integrity through seven aspects or qualities: location, design, setting, materials, workmanship, feeling, and association. These qualities should also be discussed under the Statement of Significance, Section 8 of the registration form.

Location

Location is the place where the historic property was constructed or the place where the historic event took place. Integrity of location refers to whether the property has been moved or relocated since its construction. A property is considered to have integrity of location if it was moved before or during its period of significance. Relocation of an aid during its active career if the move enhanced or continued its function is not a significant loss of integrity. For example, in 1877, the 1855-built Point Bonita Light was relocated from a high bluff to a rocky promontory to improve its visibility to mariners. Aids to navigation relocated to serve new purposes after being decommissioned suffer a serious loss of integrity of location, but are not automatically precluded from listing.

Design

Design is the composition of elements that constitute the form, plan, space, structure, and style of a property. But properties change through time. Lighthouses may be raised or shortened; buildings may be added or removed from a light station; sound signal equipment and optics may change to reflect advancing technology. Changes made to continue the function of the aid during its career may acquire significance in their own right. These changes do not necessarily constitute a loss of integrity of design. However, the removal of equipment that served as the actual aid to navigation—a fog signal, lens and lamp, or the distinctive daymarkings on a tower—has a considerable impact on the property. Removal of an optic from a lighthouse, a fog horn or bell from its building, or painting over a historic lighthouse's pattern has a serious adverse effect on its design integrity. The design integrity of light stations is reflected by the survival of ancillary buildings and structures. The decision to nominate a station should include an assessment of the design integrity of the property as a complex. The loss or substantial alteration of ancillary resources, such as keepers' quarters, oil houses, cisterns, and tramways, for example, may constitute a significant loss of design integrity.

Setting

Setting is the physical environment of a historic property that illustrates the character of the place. Integrity of setting remains when the surroundings of an aid to navigation have not been subjected to radical change. Integrity of setting of an isolated lighthouse would be compromised, for example, if it were now completely surrounded by modern development.

Materials

Materials are the physical elements combined in a particular pattern or configuration to form the aid during a period in the past. Integrity of materials determines whether or not an authentic historic resource still exists.

Workmanship

Workmanship is the physical evidence of the crafts of a particular culture or people during any given period of history. Workmanship is important because it can furnish evidence of the technology



The Aransas Pass Light Station is the second oldest lighthouse on the Texas coast. First lighted in 1857, the station exhibited its beam from the top of a cylindrical brick tower that remained unpainted. A white light emanated from a fourth order, fixed Fresnel lens. During the Civil War, the tower was a daymark for blockading Federal vessels as well as a viewing platform for Union sailors. In December 1862, Confederate soldiers blew off its top with black powder. Relighted in 1867, the light guided shipping along the Texas coast. (Kay Franklin)

of the craft, illustrate the aesthetic principles of a historic period, and reveal individual, local, regional, or national applications of both technological practices and aesthetic principles.

Feeling

Feeling is the quality that a historic property has in evoking the aesthetic or historic sense of a past period of time. Although it is itself intangible, feeling is dependent upon the aid's significant physical characteristics that convey its historic qualities. Integrity of feeling is enhanced by the continued use of a historic optic or sound signal at a light station. The characteristic flashing signal of a light adds to its integrity. While sounds themselves, such as the "Bee-oooohhhh" of a diaphone, cannot be nominated to the National Register, they enhance the integrity of feeling. The mournful call of fog horns on San Francisco Bay is an integral part of experiencing life there.

Association

Association is the direct link between a property and the event or person for

which the property is significant. A period appearance or setting for a historic aid to navigation is desirable; integrity of setting, location, design, workmanship, materials, and feeling combine to convey integrity of association.

PREPARING THE NATIONAL REGISTER NOMINATION

While basic instructions for completing nominations are found in National Register Bulletin 16, *Guidelines for Completing National Register of Historic Places Forms*, several sections of the form will require the specialized information provided in the following guidelines. For the purposes of the National Register, single aids to navigation are classified as *structures*, or, if in ruins, as *sites*. Sometimes they are parts of districts which include buildings, other structures, or objects.

In the narrative in Section 7, Description, and in Section 8, Statement of Significance, of the registration form, develop fully and concisely the information and analyses conducted in the evaluation process.

Section 7: Description

The evaluation begins with the compilation of a narrative description of the aid to navigation. This description, included in Section 7 of the registration form, should commence with a discussion of the aid to navigation's location, ownership, and status. For example:

The Point Bonita Lighthouse is located on the rocky promontory of Point Bonita, the point projecting out from the northern headlands of the Golden Gate and the entrance into San Francisco Bay. The lighthouse sits at one end of the point; located close by on the steep rocky slopes are a fog signal, bridge, and a tramway leading to the landing and a tunnel that connects the light to a road that in turn leads to the headlands, the location of the keeper's quarters and associated outbuildings and structures. Owned by the U.S. Coast Guard and leased to the National Park Service, Point Bonita Light is undergoing restoration but is open to the public for guided tours.

The description should then identify the type of aid and discuss the specifics of the individual aid. An individual station may have nearly any combination of types of aid to navigation. The

aid may be a station composed solely of a light, a light station with sound signal, a sound signal station, or a sound signal station with a light later added. These distinctions are important since stations established solely as sound stations were rare and consequently may possess greater significance. Since the most common type of aid to navigation considered for nomination to the National Register is the lighthouse, which usually is part of or solely forms a light station, most nominations should focus on the specific type of light. The discussion of the evolution of a particular station's purpose and role also helps to establish significance.

The sites of aids to navigation are generally referred to as light stations. These range in complexity from buoy moorings and pile lights to multiple structure and building complexes that supported the operation, provided access to, and housed and supported the keepers of lighthouses. Often several functions are combined in a single structure. Stations may include at least some of the following resources:

- lighthouse
- sound signals
- keepers' quarters (sometimes housed in the same structure as the light)
- oil house (sometimes housed in the same structure as the light)
- storage facilities
- garages, roads, and stables (associated with ground transportation)
- cisterns (for drinking water and for the boilers of steam-driven fog signals)
- bridges, tunnels, paths, catwalks (associated with pedestrian access)
- piers, cranes, davits, landings, boat-houses, marine railways (associated with water transportation)
- cemeteries
- fences, landscaping
- tramways and handcars for transportation of residential fuel (coal or cordwood), lamp oil, and supplies
- wells and privies
- barns, pigsties, and hen coops
- sheds (for storage of cordwood, coal, and equipment)
- vegetable gardens

Exterior Description

The descriptive narrative should focus first on the principal feature of the light station. Lighthouse types and construction methods varied depending on the period, geography, weather, sea conditions, and the availability of materials. The basic characteristic most



Thomas Point Shoals Light Station, standing in Maryland's Chesapeake Bay, is a hexagonal screwpile, offshore light. Screwpile refers to the nine metal pilings, tipped with two blades arranged in screw fashion, which support the structure. This method of anchoring an aid to navigation was most appropriate for the sandy, muddy bottom of the bay. In this historic photograph, taken in 1885, ten years after the completion of the light, its roof is topped with dormers and a steel octagonal cupola containing the light. (U.S. Coast Guard)

lighthouses share is a tower of some sort. The characteristics of the tower should be elaborated, including:

- the shape (e.g., square, conical, octagonal)
- construction materials
- construction method
- the height of the tower
- dimensions at the base and near the lantern
- the architectural style or design.

The daymark characteristics of lighthouses differentiated towers. These were often painted patterns or distinctive architectural features. The description of the lighthouse structure should include the foundation type and the reasons for using that foundation in that location. This is particularly necessary when engineering is an area of significance. Architectural features should also be described.

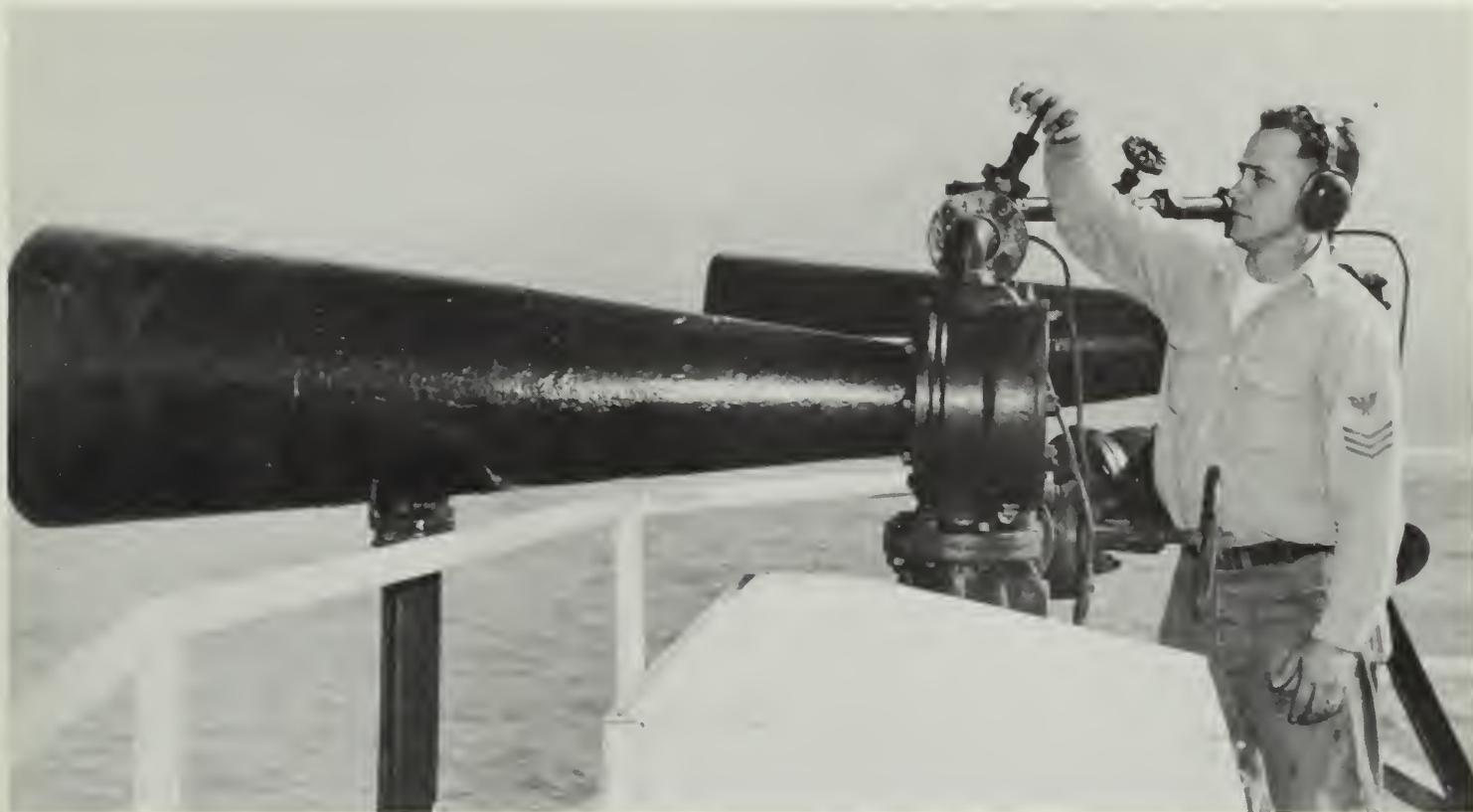
A lighthouse description should begin like this:

The Cape Disaster Light is a solitary round brick tower that rises 111 feet; at the base the tower is 36 feet in diameter, gradually

tapering to 23 feet where the brick tower culminates in the iron lantern. The brick, laid in a common American bond, is unfinished on the interior but is plastered on the exterior. The light is painted with alternating bands of black and white which serve as the distinguishing characteristics of the tower as a daymark. The light has a double set of wood doors at the base with a small stone stoop; above the door, set approximately at the 30-, 60-, and 90-foot levels of the light are three small windows with double hung wood sashes. The lighthouse tower rests on a broad brick pad laid over wooden pilings; this foundation spreads the weight of the tower and supports the lighthouse on the soft, shifting sands of the Cape.

Interior Description

The nomination should next describe the interior of the lighthouse, particularly if the tower is integral to the keeper's quarters, oil room, or other spaces. Towers might range in complexity from a conical tower with an interior spiral staircase to a multiple component



Sound signals, such as bells, whistles, and horns, have been used to guide and protect vessels. This steam-driven diaphone emitted a loud noise to route ships. (U.S. Coast Guard)

structure. A description of a more complex station might read:

The Davis Harbor Lighthouse contains three rooms. The central room, entered through the front door, is an open 30 x 20-foot area with a wood floor and a central spiral staircase that ascends to the tower and lantern. A single window and the back door are set into the back wall with doors centered in the side walls. This room served as the parlor of the keeper's quarters. The door on the left (upon entering) leads into the west room, a small 15 x 20-foot area with a wood floor. This was the oil room; originally lined with wood shelves, it has two double-hung wood sash windows, one each on the front and rear walls. When the light was electrified in 1919, the room was converted into a storage area and later into an office. The east room, another 15 x 20-foot area with a wood floor, was divided into two smaller rooms, the kitchen and bedroom.

Optics and Illuminants

The nomination then should discuss the optic(s) and illuminants used to provide a light signal. Detailed descrip-

tions of every particular lens and lamp employed in the light are not required, but basic information should be mentioned. For example:

The light was originally lit in 1839 by an Argand lamp with parabolic reflector. In 1857 the light received a 2nd order Fresnel lens illuminated by a five-wick oil lamp which was replaced by an electric incandescent bulb in 1908. In 1947 the significance of the harbor having declined, the light was downgraded to a 4th order Fresnel lens that was removed in 1962. There is currently no optic in the light.

Descriptions of the optic should cite the elevation of the focal plane above mean high water (not to be confused with the actual height of the tower) and any changes that have occurred. The characteristics of the light, including the use of color and flashing signals, should also be described. These characteristics can be determined for the light by consulting a succession of U.S. Coast Guard Light Lists. (See **RECOMMENDED BIBLIOGRAPHY AND SOURCES.**)

Sound Signals

Another important feature of a light or sound station is the sound signal. Nine basic types of sound signals have been employed in the history of aids to navigation: bells, cannon, whistles, trumpets, diaphones, diaphragm horns, submarine bells, gongs, and electronic tones. A variety of devices have been employed to operate the bells, whistles, horns, and gongs, including clockwork mechanisms, steam, compressed air, and wave motion. The description of a sound signal should note the basic type of signal and then describe the structure and equipment. If a sound signal is no longer present at the site, a detailed description of the equipment is not necessary. A basic notation of type will be sufficient, particularly if the evolution of sound signals at a given station is narrated. For example,

The emplacement of a 24-pdr. flank howitzer at Point Anderson in 1855 introduced the first fog signal at the light. The gun was fired every 20 minutes in thick fog. In 1861, the gun was replaced by a wooden



The Cape St. Elias Light Station in Alaska was the pride of the Lighthouse Service. In 1915, the light and fog signal apparatus was exhibited as the latest model of lighting at the Panama-Pacific International Exposition in San Francisco before installation in this new station. The Cape St. Elias Light was an indispensable navigational aid along the shipping lanes from the contiguous American States and southeastern Alaska to Valdez and Anchorage and northward. (U.S. Coast Guard)



The First Cape Henry Lighthouse sits on the Chesapeake Bay in Virginia Beach, Virginia. Constructed in 1792, it was the first lighthouse to be erected by the Federal government. The 90-foot, sandstone octagonal tower lined with brick was in constant use until 1881. (National Park Service)

building housing a bell struck every 90 seconds by a Stevens Automatic Bell Striker. The fog bell was replaced in 1886 by the present building, a single-story brick structure, which originally housed a steam-driven whistle that was replaced with a diaphone in 1916. The diaphone was replaced with a compressed air-driven diaphragm horn which was deactivated in 1978 and replaced by a small electronic tone signal which is presently in use at the site.

The particulars of extant machinery, including the manufacturer, if known, should be cited (e.g., a Stevens Automatic Bell Striker, or a 2,000-lb. cast bronze bell cast with the raised legend U.S.L.H.E. 1898).

Daymarks

In addition to the daymark feature of particularly marked lighthouses, other daymarks included beacons, pointers, channel markers, painted rocks and other distinctive landmarks that lined channels on rivers, bays, and sounds. Over time many daymarks were lit, first by eight-day oil lanterns, and later

by a succession of illuminants. In describing daymarks, either as lights or simple beacons, note whether they are on single piles, dolphins, or skeleton structures. The distinctive markings or shape of the daymark should also be described. This information may be ascertained by consulting the *Light List*.

Daymark ranges and range or leading lights were paired structures designed to indicate a course to steer or a danger to avoid. The two structures are vertical and separated from one another. They are lined up visually to indicate the bearing of the channel or hazard. These may be small unlit daymarks separated by tens of feet, or large lighthouse towers separated by over a mile. In describing range lights, the distance from each other and the line of bearing should be noted along with the landmark to which they are pointing (e.g., the lights, 3/4 of a mile apart on a 320 degree bearing, pointed out the channel that led into Danielsville Harbor).

Site Layout and Other Features

The interrelationship of the build-

ings, structures, fences, paths, roadways, plantings, trees, and open space should be described and assessed. The nomination should focus on the concept of a light station as a historic district unless the aid is an isolated automatic aid, such as range lights, which were often isolated automated aids to navigation, or river lights, which were usually suspended from poles or mounted on pilings.

The layout of the site should be described. All property features, including the roads, open spaces, alterations to the topography such as road cuts or shaped hillsides to accommodate a light station, plantings, and fences formed the station. Major elements should be described individually and in relationship to each other. Examples of such elements include: large areas covered with cement to form catchment basins for rain water for drinking, washing, and creating steam for the fog signal; cemeteries where keepers and their families were buried, sometimes next to shipwreck victims; or structures designed to combat erosion. Architec-



Rising above the skyline in Cape May, New Jersey, the Cape May Point Lighthouse is an active aid to navigation. First lighted in 1859, the conical tower is painted solid white with a red brick lantern; originally, it had a gray wash. (Candace Clifford)

tural descriptions of any other structures, features, or buildings should then follow. Only extant buildings and structures need to be described in any detail. But those no longer present should be mentioned and their relationship to the surviving features explained: "a 12 x 15-foot single story oil house formerly stood on the road above the light; it was demolished in 1923."

Integrity

In the Description Section, the integrity of the aid needs to be thoroughly documented, discussing original type, materials, workmanship, and any changes that have occurred through time. Alterations need to be discussed and assessed in relation to the historic context. If a lighthouse was changed, the reasons, such as improved optical or lighting technology, should be noted. Such changes, as stressed earlier, do not necessarily adversely affect the lighthouse's integrity.

Section 8: Statement of Significance

The significance of an aid to navigation is based on its representation of a

type, its association with significant themes in American history, and its comparison with similar aids.

The evaluation of an aid to navigation must include thorough historical research into its construction and modifications, including changes to sites, equipment, additions, and operation. Rather than offering just a chronological discussion of a light station's career, the historical narrative included in the Statement of Significance Section of the registration form should be organized into specific context statements. The statements should specify an aid to navigation's place in social, political, economic, architectural, or technological history. This might include a discussion of the following subjects:

- the development of humanitarian concern for mariners
- the protection of commerce and transportation
- the assumption of and increasing responsibility of the federal government in operating aids to navigation
- American maritime trade, engineering, and commerce
- the various designs of American lighthouses, lenses, lamps, and sound signals.

Specific historic contexts might involve a lighthouse's place in the development of Colonial lights in North America; the construction, organization, and operation of lights under the Fifth Auditor of the Treasury or the Lighthouse Board; or the changes wrought by the introduction of the Fresnel lens. The historical discussion should enumerate the reasons for establishing the aid, such as numerous shipwrecks or political pressure, as well as factors influencing the selection of a site and construction method, such as logistical or funding problems, and adverse natural conditions.

The significance statement should be concise and well-developed. The information in the nomination will vary according to the aid to navigation's significance to the local community, State, or the Nation. The development of lights on Chesapeake Bay, for example, may be of less significance to a particular lighthouse than its place in the national development of screw pile lighthouses.

In discussing significance, link the aid to international, national, regional, and local historic contexts, as appropriate. Convey the specific association of a lighthouse to specific historic events. If

Criterion B is applicable, an aid to navigation's association with the significant individual(s) should be discussed. Assess the aid's relation to similar properties with similar associations. Derive statements of significance from primary sources and scholarly secondary historical or professional engineering assessments. Thorough historical research is recommended in preparing National Register registration forms so that the best available information is analyzed and presented.

In the Statement of Significance, assess and justify the period during which the property achieved historic significance. The period of significance relates to the date that the current aid to navigation was built or to the dates of significant associations. The period of significance may include the date that the station site was established if significant historic resources with integrity from that period survive. The close of the period of significance might be the disestablishment, automation, or transfer of a site to new owners. For example:

Lighthouse X, important as a good example of a screw pile light, was built in 1886 on the site of former Lighthouse A, built in 1770. An appropriate period of significance for Lighthouse X would be its date of construction or 1886, not 1770. The period of significance could include the earlier period only if archeological information obtained on the site of Lighthouse A would significantly supplement or revise current historical or archeological knowledge or understanding.

Section 9: Major Bibliographical References

In Section 9, the bibliography should list sources consulted in the evaluation process as well as those specifically cited. The citations may be organized alphabetically, in categories (such as manuscripts, published works, plans, and collections of historic photographs and other graphics) or in any standard bibliographic style.

Section 10: Geographical Data

The boundary of the aid to navigation, indicated in Section 10 of the registration form, should encompass all nominated historic features described and evaluated in sections 7 and 8. Property boundaries, as long as they do not include large portions of unde-



The Point Fermin Lighthouse was the first substantial aid to navigation established at San Pedro and Los Angeles Harbor. Built in 1874, the structure combined the light tower with a residence for the keeper. The Victorian-style station has wooden board and batten siding. Comparing the current condition of the light with the photograph taken in 1917 demonstrates the historic integrity of this lighthouse. (James P. Delgado, National Park Service)



veloped land or too many intrusive features (such as a modern housing development built up around a light), may conform to the original surveyed station boundaries. Offshore lights on reefs or shoals should have a boundary encompassed solely by the maximum dimensions of the structure. For example, "Jones Reef Light, 30 x 40 feet on screw piles, as it rests on Jones Reef."

Accompanying Documentation

To assist in the National Register assessment of integrity and significance, individual photographs should illustrate the aid to navigation, its equipment, characteristic and significant features, as well as depiction of changes. Both historic and modern views are useful. Only black and white photographs, ranging in size from 3 1/2" x 5" to 8" x 10" will be accepted. In addition to the required USGS map, it is useful to include a site map preferably with scale, accurately depicting the various resources and any alterations to the geography, such as hillside cuts, tunnels, roads, and plantings or groups of trees. Architectural drawings of aids to navigation, both historic plans and present-day renderings, may be included when available but are not re-

quired. If a station has changed significantly over time, a site plan might include earlier plans that depict former and present configurations.

NATIONAL HISTORIC LANDMARKS

An aid to navigation may potentially qualify as a National Historic Landmark. Landmark designation requires a property to possess exceptional significance to the Nation's history, and a high degree of integrity by meeting criteria on national significance and integrity specified in the regulations of the National Historic Landmarks Program (36 CFR Part 65).

Landmark studies are prepared on National Register nomination forms and, ordinarily, are part of a thematic study which evaluates the comparative significance of a large body of resources. The NPS has included aids to navigation in its theme study *The Maritime Heritage of the United States*. Consultation with the maritime resources staff of the NPS History Division, Washington Office at the earliest stage in the preparation of a Landmark nomination form will facilitate the development of a well-documented study as required by the criteria for national significance.

RECOMMENDED BIBLIOGRAPHY AND SOURCES

National Park Service Publications

National Register Bulletins

No. 2 *Nomination of Deteriorated Properties*

No. 12 *Definition of Boundaries for Archeological Properties*

No. 14 *Guidelines for Counting Contributing and Non-Contributing Resources*

No. 15 *Guidelines for Applying the National Register Criteria for Evaluation*

No. 16 *Guidelines for Completing National Register of Historic Places Forms*

No. 19 *National Park Service Procedures and Policies for Processing Nominations*

No. 20 *Nominating Historic Ships and Shipwrecks to the National Register*

No. 21 *How to Establish Boundaries for National Register Properties*

No. 22 *Guidelines for Evaluating and Nominating Properties That Have Achieved Significance Within the Last Fifty Years*

No. 23 *How to Improve Quality of Photos for National Register Nominations*

No. 25 *Directory of Technical Assistance*

No. 28 *Using the UTM Grid System to Record Historic Sites*

No. 29 *Guidelines for Restricting Information About Historic and Prehistoric Resources*

No. 32 *Guidelines for Evaluating and Documenting Properties Associated with Significant Persons*

The above publications may be obtained by writing to the National Register of Historic Places, U.S. Department of the Interior, National Park Service (413), P.O. Box 37127, Washington, D.C. 20013-7127.

Maritime Preservation Program

National Maritime Initiative Inventory of Historic Aids to Navigation, a photocopied publication, is available at no charge by writing the Maritime Preservation Program, National Park Service (418), P.O. Box 37127, Washington, D.C. 20013-7127.

National Historic Landmarks Program

Further information concerning the National Historic Landmarks Program may be obtained by writing the National Historic Landmarks Program, National Park Service (418), P.O. Box 37127, Washington, D.C. 20013-7127.

Published Sources

These are provided as an indication of the variety of source materials available as well as certain highly recommended works which will aid researchers. This listing is not intended to be a comprehensive bibliography.

Adamson, H.C. *Keepers of the Lights*. New York: Greenberg, 1955.

Albion, Robert Greenhalgh. *Naval and Maritime History: An Annotated Bibliography*. Mystic, Connecticut: The Marine Historical Association, Inc., 1972.

Blunt, Edmund and George. *Blunt's Coast Pilot*. New York, New York: E. & G. Blunt, various editions to 1856.

Brewington, Marion V. *Chesapeake Bay: A Pictorial Maritime History*. Cambridge, Maryland: Cornell Maritime Press, 1953.

Campbell, John F. *History and Bibliography of the New American Practical Navigator and the American Coast Pilot*. Salem, Massachusetts: The Peabody Museum, 1964.

Capron, Walter C. *The U.S. Coast Guard*. New York: Franklin Watts, Inc., 1965.

Conklin, Irving. *Guideposts of the Sea*. New York: MacMillan and Co., 1939.

Gibbs, James A. *Sentinels of the North Pacific*. Portland, Oregon: Binfords and Mort, 1955.

Heap, D.P. *Ancient and Modern Lighthouses*. Boston, n.p., 1889.

Holland, Francis Ross, Jr. *America's Lighthouses: An Illustrated History*. Brattleboro, Vermont: Stephen Greene Press, 1972, 1981, reprint ed. 1988, Dover Publications, Inc., New York.

Hussey, John A., ed. *Early West Coast Lighthouses*. San Francisco: The Book Club of California, 1964.

Johnson, Arnold B. *The Modern Lighthouse Service*. Washington, D.C.: Government Printing Office, 1890.

Johnson, Robert Erwin. *Guardians of the Sea: History of the United States Coast Guard, 1915 to the Present*. Annapolis, Maryland: United States Naval Institute, 1987.

de Kerchove, Rene. *International Maritime Dictionary: An Encyclopedic Dictionary of Useful Terms and Phrases, Together With Equivalents in French and German*. New York: Van Nostrand Reinhold Co., 1961.

Kobbe, G. "Life in a Lighthouse," *The Century Magazine*, XL, January 1894.

Macy, Robert H. "Consolidation of the Lighthouse Service with the Coast Guard," *United States Naval Institute Proceedings* LXVI (1), January 1940.

Manning, Gordon P. *Life in the Colchester Reef Lighthouse*. Shelbourne, Vermont: The Shelbourne Museum, 1958.

Mills, Robert. *The American Pharos, or Lighthouse Guide*. Washington, D.C.: Thompson and Homans, 1832.

Nordhoff, Charles. "The Lighthouses of the United States," *Harpers Magazine*, XXXVIII, March 1874.

Martone, Camille, et al. *Preserving Historic Lighthouses: An Annotated Bibliography*. Washington, D.C.: Government Printing Office, 1989.

O'Brien, T. Michael. *Guardians of the Eighth Sea: A History of the U.S. Coast Guard on the Great Lakes*. Washington, D.C.: U.S. Coast Guard, 1976.

Putnam, George R. "Beacons of the Sea," *National Geographic Magazine*, XXIV, January 1913.

_____. *Lighthouses and Lightships of the United States*. Boston: Houghton Mifflin Co., 1917 and 1933.

_____. *Sentinel of the Coasts: The Log of a Lighthouse Engineer*. New York: W.W. Norton, 1937.

Scott, Kenneth. "The Sandy Hook Lighthouse," *The American Neptune* XXV (2), April 1965.

Shanks, Ralph and Janetta Thompson Shanks. *Lighthouses of San Francisco Bay*. San Anselmo, California: Costano Books, 1976.

_____. *Lighthouses and Lifeboats of the Redwood Coast*. San Anselmo, California: Costano Books, 1977.

Stevenson, Alan D. *The World's Lighthouses Before 1820*. London: Oxford University Press, 1959.

Stick, David. *North Carolina Lighthouses*. Raleigh, North Carolina: North Carolina of Archives and History, 1982.

Strobridge, Truman R. *Chronology of Aids to Navigation and the Old Lighthouse Service, 1716-1939*. Washington, D.C.: Government Printing Office, 1974.

U.S. Coast Survey. *Pacific Coast Pilot*. Washington, D.C.: Government Printing Office, 1854, 1858, 1889 and subsequent editions. See also other *Pilots* for information on selected lights.

Udpike, Richard W. "Augustin Fresnel and His Lighthouse Lenses," *The Log of Mystic Seaport*, XIX (2) 1967.

- _____. "Winslow Lewis and the Lighthouses," *The American Neptune*, XXVIII (1), January 1968.
- U.S. Bureau of Lighthouses. *Lighthouse Service Bulletin*. 1917- .
- U.S. Coast Guard. *Historically Famous Lighthouses*. Washington, D.C.: Government Printing Office, 1957.
- _____. *United States Coast Guard Annotated Bibliography*. Washington, D.C.: Government Printing Office, 1982.
- _____. *The Light List*. 7 vols., Washington, D.C.: Government Printing Office, 1987.
- U.S. Lighthouse Board. *Annual Report of the U.S. Lighthouse Board*. Washington, D.C.: Government Printing Office, 1852-1939.
- _____. *Documents Relating to Lighthouses, 1789-1871*. Washington, D.C.: Government Printing Office, 1871.
- _____. *Instructions to Light-Keepers, July 1881*. Washington, D.C.: Government Printing Office, 1881.
- _____. *Organization and Duties of the Lighthouse Board; and Rules, Regulations, and Instructions of the Lighthouse Establishment of the United States with the Laws and Circulars Relating Thereto*. Washington, D.C.: U.S. Government Printing Office, 1869.
- Weiss, George. *The Lighthouse Service: Its History, Activities and Organization*. Service Monographs of the United States Government, No. 40, Baltimore, Maryland: The Johns Hopkins University Press, 1926.
- Wroth, Lawrence C. *Some American Contributions to the Art of Navigation, 1519-1802*. Providence, Rhode Island: 1947.



The Lime Kiln Light Station marks an eastern point on Hard Strait in the Puget Sound of Washington. The complex, consisting of the light and fog signal building, the keeper's and assistant keeper's dwellings, the shop, and the oil and coal house, is unique because the entire station was designed concurrently in 1917. Furthermore, all the buildings are made of reinforced concrete, an early use of this material for buildings of such varied functions. Lime Kiln is the first and only known example in the Pacific Northwest of such extensive use of the material; virtually every major lighthouse built in this area since 1917, has been made of concrete. (U.S. Coast Guard)

Journals

The American Neptune: A Quarterly Journal of Maritime History. American Neptune Inc. Quarterly, 1941- . Peabody Museum, Salem, Massachusetts.

Inland Seas. Great Lakes Historical Society. Quarterly, 1945- . 480 Main Street, Vermillion, Ohio.

United States Lighthouse Society *Keeper's Log.* 244 Kearny Street, San Francisco, California 94108.

The Log of Mystic Seaport. Quarterly, 1948- . Mystic Seaport Museum, 50 Greenmanville Avenue, Mystic, Connecticut 06355.

U.S. Naval Institute *Proceedings.* 2062 Generals Highway, Annapolis, Maryland 21401.

Sea History. National Maritime Historical Society, 132 Maple Street, Croton-on-Hudson, New York 10520.

Waterways Journal. Weekly. 319 N. Fourth Street, St. Louis, Missouri 63102.

HISTORICAL AND PRESERVATION ORGANIZATIONS CONCERNED WITH HISTORIC AIDS TO NAVIGATION

The Council of American Maritime Museums, c/o Maine Maritime Museum, 963 Washington Street, Bath, Maine 04530.

Great Lakes Lighthouse Keeper's Association, P.O. Box 80, Allen Park, Michigan 48101.

Lighthouse Preservation Society, P.O. Box 736, Rockport, Massachusetts 01966.

National Trust for Historic Preservation, 1785 Massachusetts Avenue, NW, Washington, D.C. 20036.

Society for Industrial Archeology, Room 5020, National Museum of American History, Washington, D.C. 20560.

United States Coast Guard Historian, Commandant "G-CP", United States Coast Guard, 2100 Second Street, SW, Washington, D.C. 20593.

United States Lighthouse Society, 244 Kearny Street, San Francisco, California 94108.

ACKNOWLEDGEMENTS

The National Park Service extends its thanks to the historians at the U.S. Coast Guard headquarters in Washington, D.C., for their assistance on this bulletin.

[illegible]

